

REMARKS/ARGUMENTS

(1) Summary of Office Action

In the Office Action dated March 22, 2006, the Examiner objected to the drawings under 37 C.F.R. § 1.183 on the basis that the drawings did not show one of the claimed features, the test bench.

In the addition, the Examiner raised a number of rejections against the claims. Claim 6 was rejected under 35 U.S.C. § 112, second paragraph, as being incomplete for omitting an essential step identified as "defining the temperature and pressure of the natural gas".

Claims 6 - 11, 13 -18 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable in light of one more U.S. references taken alone or in combination. Lastly, claims 12 and 19 were objected to as being dependent on a rejected base claim, but the Examiner indicated that these claims would be allowable if rewritten in independent for including all of the limitations of the base claim and any intervening claims.

(2) Claim Amendments

The applicant has deleted claims 1 to 24 on file and has added new claims 25 to 61. The nature of these amendments is described below in greater detail on a claim-by-claim basis.

With the deletion of claims 1 to 24, the Examiner's objections to the drawings and her rejections of the claims are now considered to be moot and accordingly, need not be addressed. More specifically, with the amendments herein described, the drawings no longer require amendment to show the test bench. None of the newly added claims 25-61 recite the test bench as a claim element.

Claim 25

New claim 25 is an independent claim directed toward a method for proving a turbine meter for use in a natural gas pipeline. The subject claim recites a plurality of steps, including the step of "... introducing a test medium into the prover system, the test medium being a gas other than air having a Reynolds number greater than the Reynolds number of natural gas at a given pressure;". Support for this limitation may be found in paragraph [0046] on page 10 of the disclosure read in conjunction with paragraphs [0060], [0061] and [0062] on page 13. For the Examiner's convenience these paragraphs have been reproduced below:

“ 0046 Until now, the advantages of using an alternate gas, such as carbon dioxide, for the purpose of proving turbine meters instead of air or natural gas has not been recognized. The focus has been on modifying mechanical elements of the prover system or turbine meter itself. In particular, it has not been recognized that using a gas that has a higher Reynolds number at a given pressure than is the case with air or

natural gas can provide an accurate test and calibration of a turbine meter at a lower pressure. As an example, the use of carbon dioxide results in Reynolds numbers that are roughly twice as large as those that result from air or natural gas at a given pressure, allowing testing and calibration to be performed accurately at lower pressures by using carbon dioxide as the test medium.

...

0060 Figure 2 shows a plot of meter error vs. Reynolds number for various test media and pressures. As illustrated in Figure 2 an air stream flowing at Q_{\max} at atmospheric pressure cannot reach a high enough Reynolds number to reach the linear region of an error curve. It is also apparent from Figure 2 that a way to obtain a more meaningful result is to push the error curve toward the linear region of the chart. In order to accomplish this, tests would have to be conducted at a higher Reynolds number, and thus a higher pressure.

0061 From the above, it can be noted that if the turbine meters were initially proved using natural gas at atmospheric pressure and the variables in equation (1) above were re-examined, in order to boost the Reynolds number of the test flow to get a more meaningful error curve, one of the following would have to be done:

1. Increase the average velocity of the flow;
2. Increase the diameter of the pipe;
3. Increase the density of the gas; or
4. Use a gas with a lower dynamic viscosity.

0062 It should be noted, however, that it is not possible to increase the maximum flow velocity in the above example since Q_{\max} has already been reached for the turbine meter. In addition, changing the pipe diameter is not an option because the turbine meter often defines the dimensions of the pipe. Therefore, one either needs to operate the test at a higher pressure (in order to increase the density of the gas), and/or replace the natural gas in the pipe with a gas that has a lower dynamic viscosity.”

In light of the foregoing, it is respectfully submitted that no new subject matter has been added to the application with the addition of this new claim 25.

The applicant further respectfully submits that new claim 25 is patentable over the prior art references cited by the Examiner, whether taken alone or in combination. In particular, the use of a gas other than air with a Reynolds number greater than that of natural gas at a given pressure, as a test medium in the performance of method for proving a turbine meter for use in a natural gas conduit, is a significant departure from the prior art. As explained in paragraph [0045] on page 10 of the specification, known methods have employed air or natural gas to prove turbine meters for natural gas conduits. None of the prior art cited by the Examiner

teaches or suggests use of a test medium other than the fluid carried in the conduit itself, let alone, a test medium that is a gas other than air with a Reynolds number greater than that of natural gas at a given pressure.

The applicant further wishes to bring to the Examiner's attention the following comments in respect of two cited prior art references.

U.S. Patent No. 5,072,416 to Francisco, Jr. et al.

Francisco, Jr. et al. describes a method for calibrating a flowmeter using a master meter and a prover. A careful reading of the reference reveals that the method described is performed using the fluid carried by the pipeline as the test medium. The reference does, however, teach that this method could be used with any fluid carried in the pipeline, such as, fuel and crude oil, gases and liquified natural gas. The reference neither teaches nor suggests that the method be carried out using a test medium other than the fluid flowing in the pipeline. This is evident from the passage found at Col. 2, lines 61 - 65 that reads as follows:

"...There is a pipe line **10** through which fluid, the flow rate of which is to be measured flows. The method can be applied to most any fluid including fuel and crude oils, gases and liquified natural gas. The fluid flows first through the meter under test **12**. "

Moreover, Francisco, Jr. et al. does not describe or suggest the claimed limitation that test medium is a gas other than air having a Reynolds number greater than the Reynolds number of natural gas at a given pressure. In light of the foregoing, the applicant respectfully submits that Francisco, Jr. et al. does not alone or in combination render the claimed method of claim 25 obvious.

U.S. Patent No. 3,538,741 of Ludwin

Ludwin describes a method of calibrating a field meter that measures the volume of a fluid, such as a gas or the like, flowing in a line or conduit. The patent of Ludwin contains no teaching or suggestion which would lead a person skilled in the art to use a fluid other than the one carried in the conduit as the test medium for a turbine meter for use in a natural gas pipeline. Further still, Ludwin does not teach a method to be carried out with a test medium other than air having a Reynolds number greater than the Reynolds number of natural gas at a given pressure. This limitation cannot be inferred from the reference. In light of the foregoing, it is respectfully submitted that claim 25 is patentable over Ludwin whether taken alone or in combination.

Claims 26 - 41

New claims 26 - 41 ultimately depend from claim 25 and are directed toward various features of the claimed method. Insofar as claim 25 is presently allowable over the cited prior art, the applicant respectfully submits that claims 26 - 41 are also allowable.

Claim 42

New claim 42 is directed toward a system for proving a turbine meter for use in a natural gas pipeline. The claimed system of claim 42 includes as a feature a test medium being a gas other than air having a Reynolds number greater than the Reynolds number of natural gas at a given pressure. None of the prior art references cited by the Examiner disclose or suggest this limitation. Moreover, this feature cannot be inferred from any of the references. In this respect, the applicant invites the Examiner to consider the comments provided above concerning the patents of Francisco, Jr. et al. and Ludwin.

Claims 43 - 61

New claims 43 - 61 ultimately depend from claim 42 and are directed toward various features of the claimed system. Insofar as claim 42 is presently allowable over the cited prior art, the applicant respectfully submits that claims 43 - 61 are also allowable.


(3) Conclusion

The present amendment imports no new subject matter into the application.

Consideration of the above-identified application is respectfully requested. If after reviewing this amendment, the Examiner believes that a telephone or personal interview would facilitate the resolution of any remaining matters, the undersigned attorney may be contacted at the number set forth hereinbelow.

June 14, 2006
Date

Respectfully submitted,


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